Assignment 04

In this assignment, you apply gradient decent to compute beta of securities following CAPM model (see the MATLAB link at the bottom):

$$R(k,i) = a(i) + C(k) + b(i) * (M(k) - C(k)) + V(k,i)$$

for samples k = 1, ... , m and assets i = 1, ... , n, where a(i) is a parameter that specifies the non-systematic return of an asset i, b(i) is the asset beta of the asset i, and V(k,i) is the residual error for asset i with associated random variable V(i). Asset alphas a(1), ... , a(n) are zeros in strict form of CAPM but non-zeros in practice. C(k) is sample k of the risk-free asset return.

The dataset CAPMuniverse contains the daily total return data from 03-Jan-2000 to 07-Nov-2005 for 12 stocks as follows: 'AAPL', 'AMZN', 'CSCO', 'DELL', 'EBAY', 'GOOG', 'HPQ', 'IBM', 'INTC', 'MSFT', 'ORCL', 'YHOO'. Columns 14 and 15 are daily return data for the market, and the risk-free rate. More information regarding the dataset is copied at the bottom of the page. You will use regression to find the betas of these securities (another way is to use the normal equation to get the analytical solution).

1. (4 points) Read, understand, and run the MATLAB code. In the code, column 13 is the return data for Yahoo (YHOO), $\theta_1$and θ_2 are

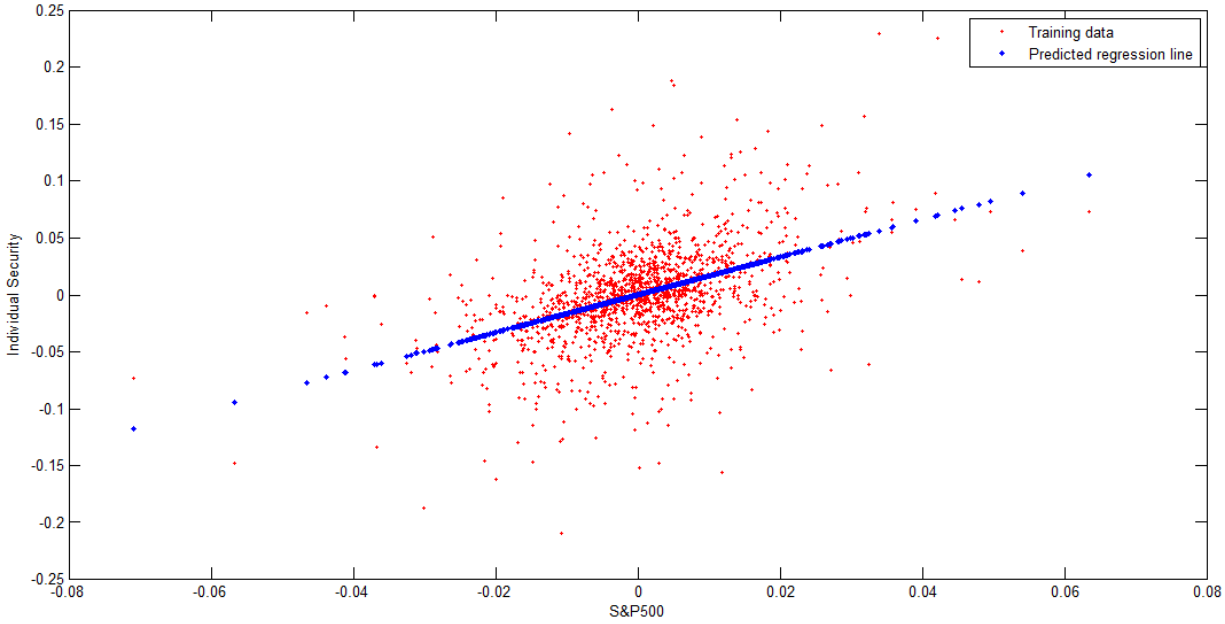
theta =

0.0001

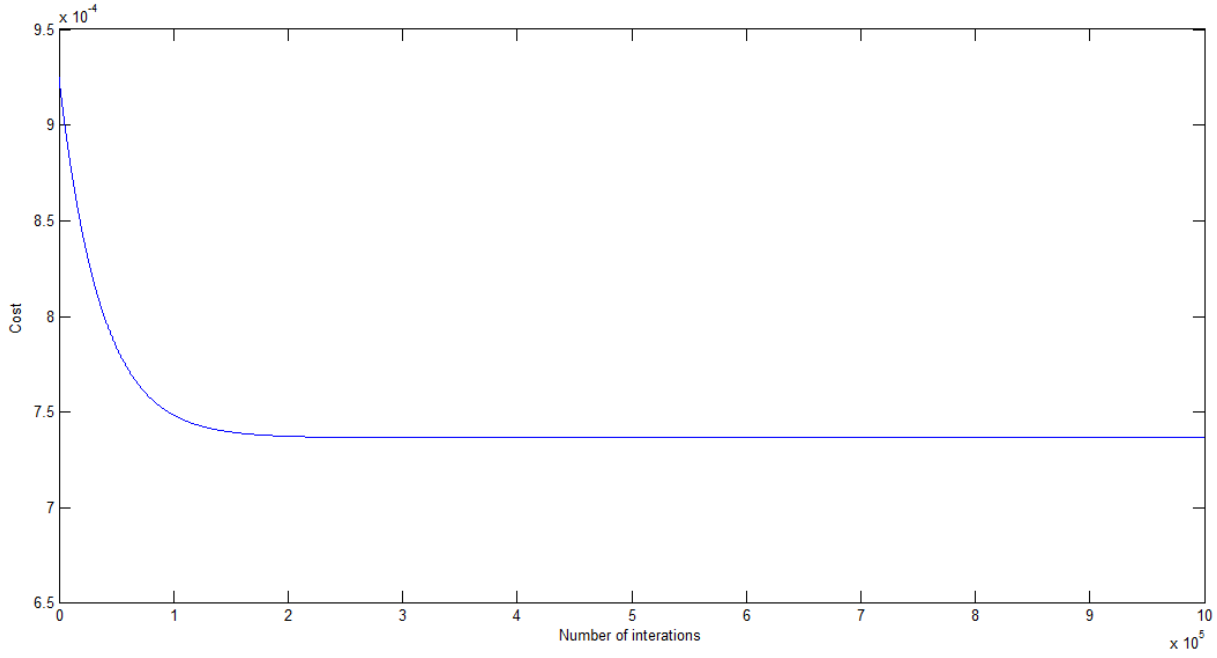
1.6543

Where $\theta_1$and θ_2 are alpha and beta values of YHOO

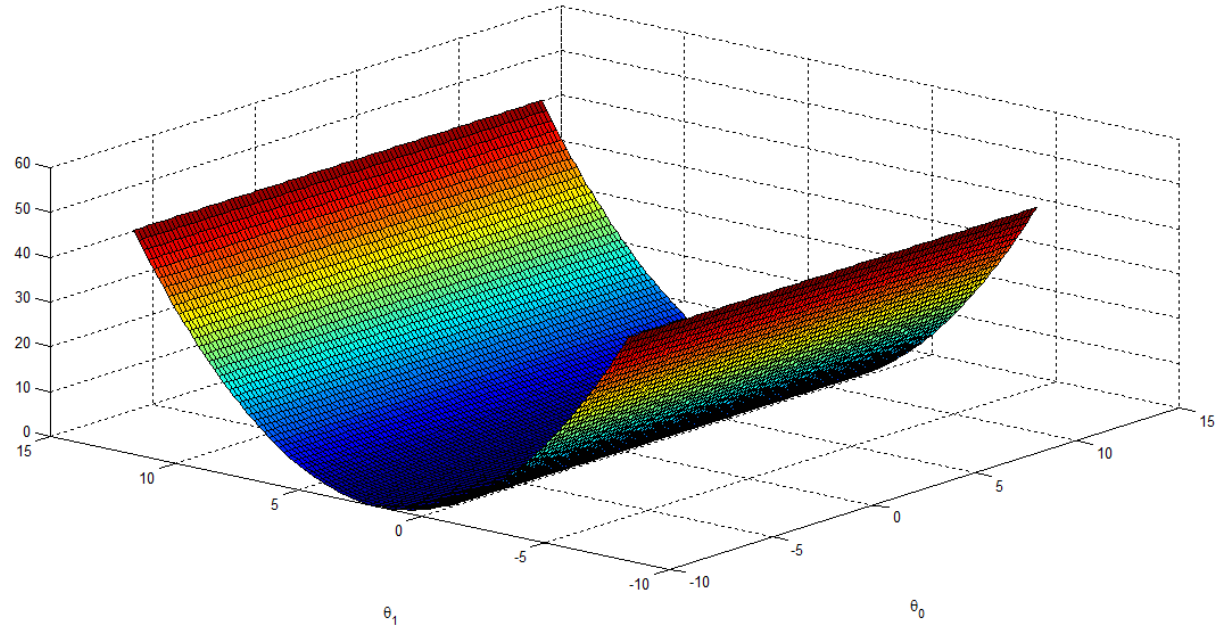
The regression line:



Cost function vs number of iterations



Cost function vs thetas



Pick either R or Python to do the work based on the working MATLAB code is given to you. 1 additional point if you write code in both Python, and R. Logics, variable names, and function names should follow the ones in the given MATLAB code as much as possible.

2. (1 point) Explain your code ***in details***, show your understanding (you can do this line by line, or small blocks of code)

Submission: your script(s), and a document to explain your work.

Note: in Python all functions can be stored in 1 file and imported to the main Python script. In R functions can be sourced in the main script, while functions are stored in separate files under the same names in MATLAB (You may need to set path in MATLAB if the function files are not in the same directory with the script)

For more information about the dataset, check this link:

(http://www.mathworks.com/help/finance/examples/capital-asset-pricing-model-with-missing-data.html).